

IOWA STATE UNIVERSITY

Digital Repository

Proceedings of the Integrated Crop Management
Conference

Proceedings of the 17th Annual Integrated Crop
Management Conference

Dec 1st, 12:00 AM

Survey of Soybean Diseases in Iowa

Alison Robertson

Iowa State University, alisonr@iastate.edu

Forrest Nutter Jr.

Iowa State University, fwn@iastate.edu

Follow this and additional works at: <https://lib.dr.iastate.edu/icm>



Part of the [Agriculture Commons](#), and the [Plant Pathology Commons](#)

Robertson, Alison and Nutter, Forrest Jr., "Survey of Soybean Diseases in Iowa" (2005). *Proceedings of the Integrated Crop Management Conference*. 16.

<https://lib.dr.iastate.edu/icm/2005/proceedings/16>

This Event is brought to you for free and open access by the Conferences and Symposia at Iowa State University Digital Repository. It has been accepted for inclusion in Proceedings of the Integrated Crop Management Conference by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

Survey of Soybean Diseases in Iowa

Alison Robertson, Assistant Professor, Plant Pathology, Iowa State University

Forrest Nutter, Jr. Professor, Plant Pathology, Iowa State University

Introduction

Soybean producers and breeders are constantly striving to increase yields. Over the past decade, soybean diseases have been the primary factors that have most limited soybean yields. For example, estimated yield losses due to *Phytophthora* stem rot, and pod and stem blight in Iowa in 2001 were 1.8 million pounds each (Wrather et al, 2002). In 2002 in Iowa, 31.5 million pounds of soybeans were lost to foliar disease, and 2.5 million pounds to the stem disease sudden death syndrome (Wrather et al, 2002). Since plant pathogens substantially decrease the yield of crop plants, information on the prevalence and geographic locations of pathogens is useful for prioritizing research to improve disease resistance in breeding programs and to improve integrated disease management programs.

During the 2005 growing season, a soybean disease survey was conducted in Iowa. The purpose of the survey was to answer some of the following questions: What foliar, stem and virus diseases of soybean are present in Iowa? What is the prevalence of each disease? What is the incidence of each disease? How does prevalence and incidence of each disease change during the growing season? Therefore, our primary objective was to geospatially map the seasonal changes in the prevalence and incidence of diseases of soybean in Iowa in 2005.

Methods and Materials

Plant samples (30 soybean plants per field) were collected at four growth stages, V2-V3, R1-R3, R4-R5, and R6-R7, during the 2005 growing season by Iowa State University Field Crop Specialists (FCS). Each FCS visited three-to-five fields in most counties across Iowa.

Soybean samples were shipped to the ISU Department of Plant Pathology. Each sample was visually assessed for both foliar diseases and stem diseases. Each leaf on the main stem of each plant was evaluated for disease severity (area of leaf area diseased, as a percentage). The presence of each foliar disease present on each plant was recorded. Each stem was evaluated for the presence of stem disease symptoms. The presence of soybean foliar and stem pathogens was confirmed by isolation of the pathogen from diseased leaf or stem tissue, and/or microscopy. In addition, the middle leaflet from the topmost trifoliate of each plant was collected for sap extraction and then tested for the presence of viruses.

This article (and conference presentation) will report on the results of the foliar and stem disease data obtained in 2005.

Data analysis of disease assessments

Disease incidence, at the field and county level, and disease prevalence were determined as follows:

$$\text{Disease incidence (\%)} = \frac{\text{No. of plants found to have a specific disease}}{\text{Total no. of plants sampled and assessed}} \times 100$$

$$\text{Disease prevalence (\%)} = \frac{\text{No. of fields or counties found to have a specific disease}}{\text{Total no. of fields or counties sampled and assessed}} \times 100$$

$$\text{Mean disease incidence (\%)} = \text{Mean of the disease incidence from fields or counties}$$

The prevalence and incidence of each disease was mapped using ArcGIS software (ESRI, Redlands, CA).

Results

Foliar diseases

Field crop specialists collected plant samples from 93 of the 99 Iowa counties during the early part of the growing season (growth stages V2-V4). These samples were evaluated for soybean foliar diseases. Bacterial blight was the most prevalent foliar disease that occurred during this growth period. This disease was found in 30 (32.3%) of the 99 Iowa counties, and brown spot was found only in one county (<1%) during this period. Of the 366 fields sampled, brown spot was found in one field (0.003%), and bacterial blight in 79 fields (21.6%). The incidence of bacterial blight within Iowa soybean fields (percentage of plants showing bacterial blight symptoms) ranged from one to 70% (Figure 1). Seventeen counties (18%) had between 1 and 10% bacterial blight incidence, 8 counties (9%) had between 10 and 20% incidence, 3 counties (3%) had between 20 and 30% disease incidence, 1 county (1%) had between 30 and 40% incidence, and 1 county (1%), namely Cherokee (1%), had between 60 and 70% disease incidence. The incidence of brown spot was between 1 and 10% in Cherokee county.

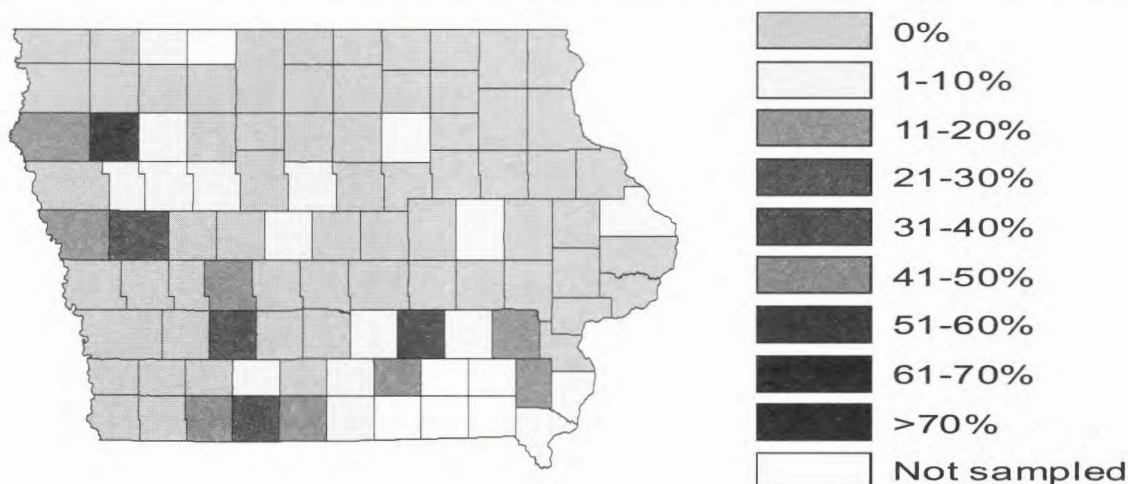


Figure 1. Incidence of Bacterial Blight during vegetative growth stages V2-V5 in Iowa during the 2005 growing season.

The second sampling period (growth stages R1-R3) was defined as samples collected between 24 June through 31 July. During this period, 265 soybean fields in 85 counties were sampled.

Bacterial blight was detected in 132 fields (prevalence = 59.2%) in 72 of the 85 counties sampled (prevalence = 85%), brown spot was detected in 77 fields (34.5%) and 57 counties (67%), frogeye leaf spot in 74 (33.2%) and 50 counties (59%), and downy mildew in 10 (4.5%) and 9 counties (11%) (Figure 2).

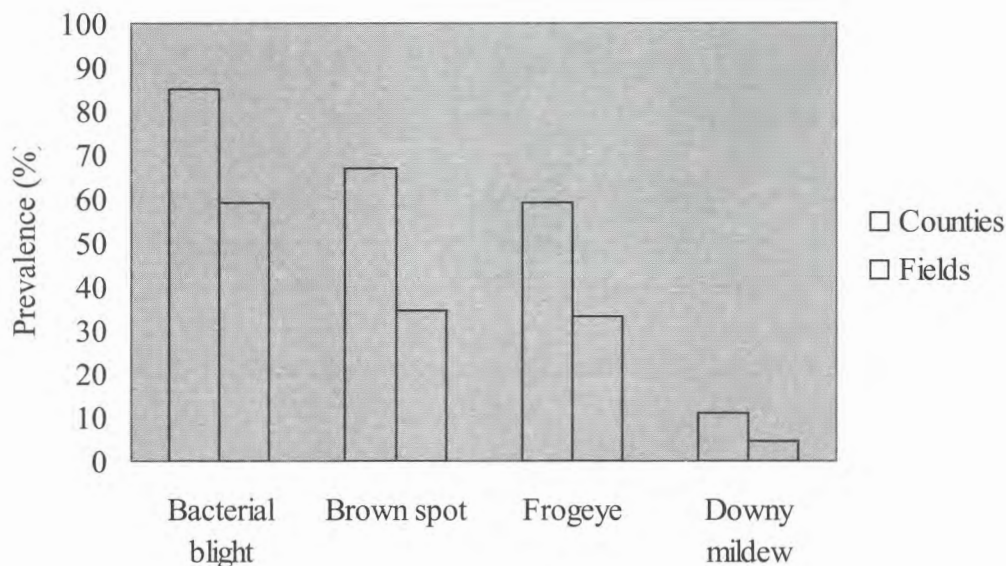


Figure 2. Prevalence (%) of bacterial blight, brown spot, frogeye leaf spot and downy mildew on both a field (hatched bars) and county (spotted bars) basis in Iowa soybean during the early reproductive growth stages (R1-R3) for soybean samples assessed during the 2005 growing season

The mean incidence (%) at the field level of the four foliar diseases found in the second soybean assessment period (growth stages R1-R3) over the 223 fields, ranged from 3 to 100% within soybean fields for bacterial blight, from 3 to 93% for brown spot, from 3 to 87% for frogeye leaf spot, and from 3 to 100% for downy mildew.

At the county level, where disease was detected, disease incidence ranged from 1-92% for bacterial blight (Figure 3), 47% for brown spot, 2-64% for frogeye leaf spot, and 1-30% for downy mildew.

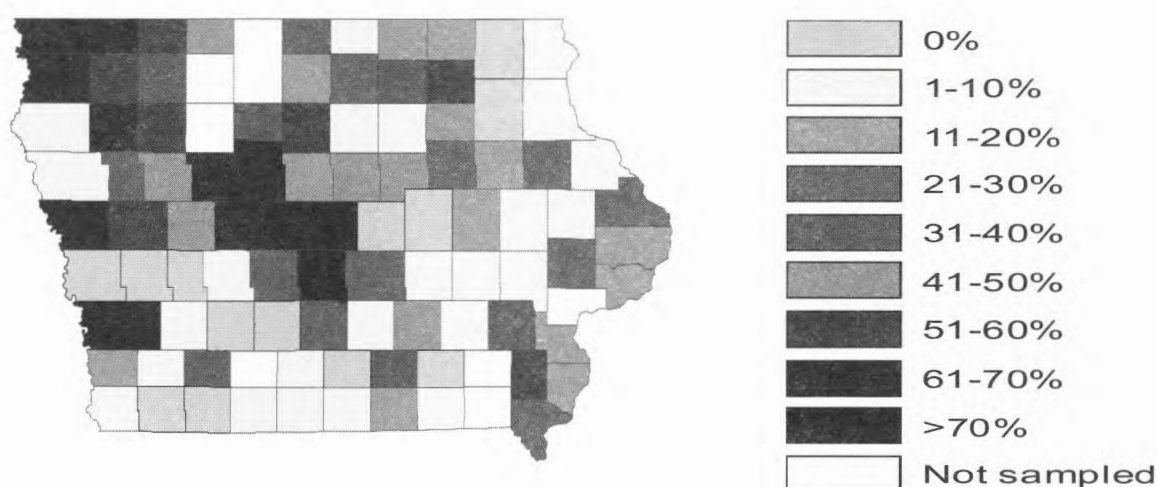


Figure 3. Incidence (%) of bacterial blight in soybean fields in Iowa during the early reproductive growth stages R1-R3 during the 2005 growing season.

The mean disease incidence over the state of Iowa for the second assessment period was 26% for bacterial blight, 8.6% for brown spot, 8.9% for frogeye leaf spot, and 1.1% for downy mildew.

Stem Diseases

Stem diseases found during the 2005 include brown stem rot, pod and stem blight, stem canker, and sudden death syndrome and white mold. Maps of disease prevalence and incidence will be shown during the presentation (additional handout).

Conclusions

This is the most comprehensive disease survey of soybeans to date. Data collected in this survey will serve as a resource for future needs in disease management. The information we have collected serves as a baseline for future soybean disease surveys, and will be used to identify relationships among diseases and to elucidate relationships between environmental factors and disease occurrence (prevalence and incidence). In addition, the data will be used to detect anomalies in disease prevalence and incidence, thereby serving as an early warning system to growers and researchers. When new diseases are emerging as potential threats, or when current disease management tactics (resistant varieties or fungicides) are no longer providing acceptable control due to changes in the pathogen. This will aid funding agencies, such as the Iowa Soybean Association, prioritize funding for soybean production research and ensure that research is proactive for emerging problems.

Acknowledgements

This work was supported by the Iowa Soybean Association. We would like to thank the ISU field crop specialists, county extension education directors and growers who collected soybean plant samples, students who helped with disease assessments and data capture, and Paul Esker and Geishe Tuke for data analysis and mapping the data.

References

- Wrather, J.A., Koenning, S.R., and Anderson, T.R. 2003. Effect on diseases on soybean yields in the United States and Ontario (1999-2002). Online. Plant Health Progress doi:10.1094/PHP-2003-0325-01-RV.